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common elsewhere, as on the petioles of the passion vine and on the leaves of the larch where bees busily search for them, among the floral organs is a not surprising result of the energy of the currents which nourish anthers and ovules.¹ Such secretions at first perhaps not abundant, nor perceptibly sweet, will be gradually increased and improved by means of this co-working of plant and insect. Stages in the evolution of nectar and of nectar-protecting organs are represented to-day, steps which connect the watery fluid found exposed the first day of blossoming in the stigmatic cavity of *Nymphæa tuberosa*, the drops of liquid at the bases of the carpels of *Caltha*, the honey protected by scales on the petal bases of *Ranunculus* and by elongated petal-bases (i. e. spurs) of *Aquilegia*, etc., with the showy buckets of *Marcgravia* from which the brilliant sun birds of India drink nectar worthy of the gods.

The result of this long-standing partnership is, that, in the place of a world of green, corolla-less flowers, our meadows are rich with the gold of daisies and buttercups; our hillsides, covered with the blue of innocence; our rocks, purple with clematis, or gay with columbine; asters and golden-rods reflect royal colors in the brooks; gentians give back the blue of the sky from the mountain pastures; and there are glorious fringed orchids for those who can find them, and they are the bees and butterflies. For the good poet was mistaken in supposing that many a flower is born to blush unseen. The bees who have made it blush will surely be there to see.

Ithaca, N. Y.

[*Concluded next month.*]

Mt. Kataadn and its flora.

F. LAMSON-SCRIBNER.

In August, 1874, a party of gentlemen from Bangor and Orono, under the direction of President M. C. Fernald of the Maine State College, made the ascent of Mt. Kataadn for the purpose of determining more accurately than had before been done, the altitude of the mountain. This work was accomplished by Prof. Fernald in a very thorough and accurate manner, and his observations were made public at that time.

Mr. F. W. Hardy, a well known photographer of Bangor,

¹ cf. BONNIER: *Comptes Rendus*, LXXXVIII. 662.

accompanied the party and succeeded in obtaining some excellent stereoscopic and other views of the mountain and its surroundings.

From Bangor we proceeded by rail to Mattawamkeag, thence thirty-five miles by stage to Sherman. From the latter place we were carried with our baggage, by private conveyance through Stacyville to "Hunt's Farm", on the banks of the East Branch, a distance of ten miles. An excellent guide was procured at Stacyville, in the person of Mr. J. C. Stacy, a gentleman who very faithfully served us on a similar excursion the year before.

Hunt's Farm was then owned by a Mr. Patterson, a stalwart and obliging man who had about him a large family of bright and healthy boys and girls. Mr. Patterson's nearest neighbors were distant about six miles, and his hospitable dwelling, which served as a hotel for the lumbermen in the winter season, was the last one on our route to the mountain. We crossed the river in a bateau and the remaining twenty miles of our journey were through a continuous forest, which we traversed on foot. There was a good logging road to within two or three miles of the mountain, so that our walk was not a severe one. Indeed a person might ride on a sure-footed horse the greater part of the distance. Within the first six miles we twice forded the Wissatiquoik River, which empties into the East Branch near "Hunt's Farm". The fords were easily and quickly accomplished, but at the second crossing our task became more laborious for we were then obliged to assume the burden of our provisions and blankets which thus far had been transported by horses.

Five miles farther on, at the foot of Kataadn Lake, we had our first good view of the mountain, sharply and boldly defined against the western sky. The sight inspired us with new courage and enthusiasm, and after a brief rest we hastened on, and near the close of the third day from Bangor we arrived at the foot of grand old Kataadn, with its naked summit majestically towering directly above us. After a good night's rest and an early breakfast we prepared for the real labor of our excursion, that of the ascent, but with it came the real enjoyment which we so long held in anticipation.

Without a load one may ascend the mountain from the foot of the eastern spur, or "ridge" as it is termed, and return in a day. But a person unused to such scenery will form but a

vague idea of the mountain if he makes but one ascent. He must ascend and reascend; he must dwell upon its lofty peaks and view in varying lights its grand proportions; he must descend its vast slides filled with decomposed granite and immense boulders that appear as though the slightest push would send them rolling down the mountain side; he must descend the "long crooked slide" where by a slip he might be dashed upon the sharp rocks hundreds of feet below or where an incautious step might set in motion an avalanche of huge boulders; he must pass down into the "notch" and over the "chimney"—a feat seemingly impossible to the inexperienced. The "narrows" must be traversed, where there is barely a footing and from whence a jump of more than two thousand feet may be made upon the one hand or a tumble hardly less great upon the other. The "northern tablelands" must be visited, and the mountain "basin", where exists a small lake of the purest water. This basin is enclosed upon three sides by perpendicular walls of solid rock, nearly two thousand feet high. All this must be done and more, ere one can obtain any correct impression of the grandeur and immensity of this mountain.

Situated in the eastern part of Piscataquis County, and in the very heart of the lake and mountain scenery of Maine, Mt. Kataadn stands without a rival in New England in the wild grandeur of its proportions; and in its alp-like character it has no equal in the Eastern States. The altitude, as determined by the observations of Prof. Fernald, is five thousand two hundred and fifteen feet, making this mountain the highest point of land in the state and but a little lower than Mt. Washington in New Hampshire. The views to be obtained from its summit can hardly be surpassed either in beauty or extent. The peculiar features of the flora of this locality cannot fail to be of interest to the student of botany, and it is our purpose to present in this paper some botanical notes made during our stay upon the mountain.

Upon a previous visit (in 1873) we made the ascent by the way of the "eastern slide", which is, perhaps, the easiest if not the best place for the purpose. Around the base of this slide a small form of the white birch is the prevailing tree; probably *Betula papyracea*, var. *minor* Tuck. Ascending the slide, this tree rapidly diminishes in size, till finally it becomes a mere dwarf and disappears entirely before reaching the first

“horseback”. The lower portion of the mountain is covered with a dense growth of dwarf black spruce, so dense as to be wholly impassable, except by tumbling or rolling over the summits of the closely growing trees.

At the foot of this slide along the borders of a cold mountain stream, grows the bright-flowered *Arnica mollis* Hook. Dr. Goodale in the Report of the Maine Board of Agriculture for 1862, in speaking of this plant, says: “It is found sparingly near Moxie Falls, a few miles from the forks of the Kennebec. It occurs in great beauty and profusion in the vicinity of the cataract of Parlin Pond stream, where its orange flowers are sprinkled with the spray of the falling water. The iridescence of the flowers as they were bathed in the sunlight and spray was a spectacle of much beauty, the orange blossoms here and there, overpowering the rainbow coloring of the drops of water.”

Nearly half way up the slide, an ice-cold spring issues from the side of the mountain, and its waters, rushing down over the steep rocks, form the brook just alluded to. Along this stream the green mountain alder, *Alnus viridis*, grows in luxuriance. Above the spring this shrub gives way to more alpine forms: we soon meet the dwarf birch (*B. glandulosa* Mx.), a rather pretty little shrub abundant on the high mountains of New England and New York, and growing as far north as Hudson's Bay. Fruited specimens less than three inches high were gathered on the “horseback”. With the birch and extending above it, we find the little mountain cranberry, *Vaccinium Vitis-Idæa*. This is a low spreading shrub with numerous short, upright branches. The berries are numerous, of a dark red color, with an acid taste. They are gathered and made into sauce, like the common bog cranberry. The sweet berries of the bog bilberry, *V. uliginosum* L., and mountain blueberry, *V. cæspitosum*, refreshed us on our tedious ascent. At the summit of the slide, occurring quite frequently and rising but an inch or two above the rocks on which it grew was Cutler's willow, *Salix Cutleri* Tuck. It may be recognized by its strongly veined, elliptical leaves. With this species occurs also *S. herbacea* L., a species of even smaller habit than the last.

Forming dense, convex mats over the surface of the rocks is the curious *Diapensia Lapponica* L., a small evergreen plant of the Phlox family. The remains of the white flowers, which

appear in July, were still present. As we neared the summit of the slide, the crowberry, *Empetrum nigrum* L., made its appearance. This is a small, prostrate, much branched shrub, with very numerous, narrow leaves, giving the plant a heath-like aspect. The flowers open in early summer. In August, the plants were loaded with small black berries. Ascending the "Horseback" towards the "Chimney", we passed large patches of the beautiful little mountain sandwort, *Arenaria Grœnlandica*. The flowers of this species are quite large when compared with the plant and are of a delicate white tint.

Upon our present trip we started from Reed's camp and proceeded through dense groves of tall spruce trees, which became smaller and yet more dense as we advanced towards the eastern spur, up which we were to climb, and such a climb! With our packs upon our backs, and no path, not even a spotted line to direct our course! We come upon huge boulders over which we must climb, or around which we must force our way through an almost impenetrable forest of dwarf birch and stunted fir. By dint of perseverance and severe exertion, we labor upward; now walking almost upon the very tops of the low but wide expanded evergreens, now losing our footing and slipping helplessly into dark caverns between high and mossy rocks. Two hours, or perhaps more, of this travel and we are above the growth of trees and have passed through that dense growth of vegetation called by the woodsmen "pucker-brush". We are now more than three thousand feet above the sea level. Our birch tree exists only as a low shrub and soon gives way to another species, the little *Betula glandulosa*, which rises but a few inches above the rocks upon which it grows, or rather to which it clings. About us there is still to be seen an occasional spruce, but so reduced in size that we can hardly recognize in it any relationship to the majestic forms that clothe the hills now far below us. For how many centuries the stunted forms before us have braved the severe mountain storms and fierce winters we know not, but that their whole existence has been one constant warfare with the untamed elements their meager and ancient appearance will testify—the vertical trunks rising but a few inches above the stony soil, the densely grown and thickly clothed branches carpeting the rocks like some sharp leaved moss. A few steps upward and we are in the midst of plant forms that belong to the frigid zone. Here in profusion we find the small moun-

tain blueberry, *Vaccinium cæspitosum*, the mountain cranberry, *V. Vitis-Idæa*, and the heathlike crowberry, *Empetrum nigrum*, plants that abound in Greenland and furnish berries that form the only vegetable diet of the dwellers in that arctic country.

The only species peculiar to Mt. Kataadn is *Saxifraga stellaris*, var. *comosa*. The other forms, so far as noted, are identical with those upon the White Mountains and other high altitudes in the United States. The upper limit of erect shrubs is between three and four thousand feet.

Below is a list of those plants observed upon the mountain or in its vicinity.

1. *Clematis verticillaris* DC. Abundant along the banks of the East Branch, in fruit. This vine grows in profusion at Orono, Maine, where it blooms about the 25th of May.

2. *Cardamine bellidifolia* L. In the "Long Crooked Slide" which runs down from near the highest peak of the mountain.

3. *Arenaria Grænländica* Spreng. Common on the rocks of the Eastern Ridge, or "Saddleback". Although perfectly at home upon the bleak mountain tops of New England, it is sometimes found in Maine upon the rocky river banks near the sea.

4. *Saxifraga stellaris* L. var. *comosa* Willd. Found only under the shade of rocks on the ridge north of the summit of the mountain. The flowers of all the specimens I saw were changed into little tufts of green leaves.

5. *Epilobium alpinum* L. Only one or two specimens seen in the "Basin" of the mountain.

6. *Linnæa borealis* Gronov. Common in damp woods throughout the State, blossoming about the middle of June. I found it growing in damp moss on several of the lower points of the mountain in bloom at the time of my visit (Aug. 15).

7. *Nardosmia palmata* Hook. Noticed in swamps near the mountain. It grows in great abundance at Orono, Maine.

8. *Aster graminifolius* Pursh. On dry rocks of the East Branch.

9. *Solidago Virga-aurea* L. var. *alpina* Bigel. In several places on the mountain. This is a bright little species of golden-rod and often expands its heads of golden yellow flowers barely an inch above the rocks on which it grows.

10. *Solidago thyrsoides* E. Meyer. Common, especially

in the "Long Crooked Slide", and near the northern "Table Lands".

11. *Gnaphalium supinum* Villars. On rocks in the "Basin". The specimens were out of bloom.

12. *Arnica mollis* Hook. Near the foot of the Eastern Slide and also along the borders of a lake near the "Eastern Spur" of the mountain, where it is very abundant.

13. *Cirsium muticum* Mx. Common near the mountain.

14. *Nabalus nanus* DC. Common on the higher portions of the mountain, especially near the northern "Table Lands".

15. *Nabalus Boottii* DC. With *N. nanus*, but not so abundant.

16. *Lobelia Kalmii* L. Abundant on rocks along the East Branch. I have also found this plant on the banks of the Kennebec at Waterville.

17. *Campanula rotundifolia* L. A diminutive mountain form grew in the "Notch" near the "Chimney". The plants were only four inches high, simple, terminated by a single flower.

18. *Vaccinium Vitis-Idæa* L. Common especially on the "Saddleback". Upon the shady and moss-covered rock-shelves on the north side of the "Chimney", specimens were gathered in flower. This is the mountain cranberry of the north. The slightly acid, refreshing berries are collected in quantities for making sauce and preserves.

19. *Vaccinium uliginosum* L. Common.

20. *Vaccinium cæspitosum* Mx. Is a very small species producing sweet, blue berries,—also common.

21. *Vaccinium Pennsylvanicum* Lam. The alpine variety of this species (var. *angustifolium*) grows on the north "Table Lands."

22. *Chiogenes hispidula* T. & G. Common on the lower portion of the mountain, also in swamps throughout the state.

23. *Arctostaphylos alpina* Spreng. Quite common on the higher altitudes. In fruit.

24. *Cassiope hypnoides* Don. This charming little heath-like plant I found only on the eastern edges of the north "Table Lands". The plants were in fruit.

25. *Kalmia glauca* and *K. angustifolia*. Found on the "Saddleback". The former in flower.

26. *Phyllodoce taxifolia* Salisb. Common along the "Narrows".

28. *Rhododendron Lapponicum* Wahl. North "Table Lands".
29. *Loiseleuria procumbens* Desv. On rocks north of the summit, common.
30. *Moneses uniflora*. In flower on the northern portions of the mountain and throughout the state in cool swamps, blooming about the last of June.
31. *Diapensia Lapponica* L. Abundant on the "Saddleback". In fruit.
32. *Polygonum viviparum* L. Found only in the "Long Crooked Slide," in flower and fruit.
33. *Empetrum nigrum* L. Very abundant in the eastern portion of the mountain.
34. *Betula papyracea* Ait. var. *minor* Tuck. Common on the lower portions of the mountain.
35. *Betula glandulosa* Mx. Common on the mountain. Well fruited specimens less than three inches high were collected.
36. *Alnus viridis* DC. Common on lower slopes along streams.
37. *Salix argyrocarpa* Anders. Common.
38. *Salix herbacea* L. On the "Saddleback", in moss.
39. *Scheuchzeria palustris* L. In a bog near the mountain.
40. *Listera cordata* R.Br. In flower in the sag between the summit and the north "Table Lands."
41. *Orchis dilatata* Gray. Common in the swamps near the mountain.
42. *Luzula parviflora* Desv., var. *melanocarpa*. Abundant.
43. *Luzula spicata* Desv. Common.
44. *Juncus filiformis* L.
45. *Juncus trifidus* L. Common.
46. *Scirpus cæspitosus* L.
47. *Carex scirpoides* Mx. Abundant on the eastern dome of the mountain.
48. *Carex canescens*, var. *vitis*. At the very summit of the mountain.
49. *Carex lenticularis* Mx. In the "basin".
50. *Carex rigida* Good. var. *Bigelovii*. On the "narrows", and also in great abundance northwest of the summit.
51. *Carex pulla* Good. ? On the shores of the little lake in the "basin".
52. *Cinna pendula* Trin. Along streams near the mountain.

53. *Calamagrostis Canadensis*. Along the mountain brooks.
54. *Poa laxa*, Hænk. On the "Saddleback".
55. *Aira flexuosa* L. Common.
56. *Hicrochloa alpina* R. & S. On the "Saddleback".
57. *Lycopodium Selago* L. Abundant along the "Narrows", etc.
58. *Lycopodium annotinum* var. *pungens*. On the Eastern Ridge.

NOTE.—The foregoing article was written in 1874; the nomenclature therefore conforms to that of the 5th edition of Gray's Manual.—F. L. S.

Knoxville, Tenn.

Noteworthy anatomical and physiological researches.

Observations on the protection of buds in the tropics.¹

While no little attention has been given to the way in which buds are protected from the cold of rigorous climates it would appear that similar adaptations to guard the delicate parts of plants from the hot and dry atmosphere and the direct rays of the sun in tropical regions have been the occasion of much less study, although this is quite as distinct and considerable a field of research. Treub called attention to the need of such adaptations in 1887, and gave several instances of their occurrence. The paper of Potter here summarized is, however, the first to give any satisfactory classification of the various methods employed by different plants, so far as the writer is able to discover. "For the purpose of description," says Potter, "it is convenient to consider these special protective contrivances under four heads," as follows:

1. Protection by means of stipules. 2. Protection by means of gum. 3. Protection by position assumed when young. 4. Protection by shade from older leaves.

Species of *Artocarpus*, *Heptopleurum*, *Canarium*, *Wormia* and *Sarcocephalus* are cited as examples of the first class. In all these the stipules form a hood over the young leaves and thus protect them from the too scorching rays of the sun. Of the second class *Tabernæmontana* is mentioned as particularly interesting. In at least one species of this genus the young leaves develop in a four-sided chamber, the walls of

¹ M. C. POTTER: Journ. Linn. Soc. xxviii, 343-352.